

WHAT IS CLAIMED IS:

1. A plasma processing apparatus including a vacuum vessel as evacuated by an evacuation system, gas supply means for supplying a processing gas into the vacuum vessel, an electrostatic chucking device for holding thereon a sample to be processed within said vacuum vessel, a lower electrode, a bias power source connected to the lower electrode for supplying bias power, and means for radiating a high frequency electromagnetic wave within said vacuum vessel, wherein said processing gas is made plasmatic and plasma is generated for use in performing processing of the sample to be processed, wherein said means for radiating a high frequency electromagnetic wave comprises an antenna which is provided within said vacuum vessel, said antenna including a circular plate-shaped conductor opposing said lower electrode and being connected to a high frequency bias power supply, and a plate contacted with said circular plate-shaped conductor, and wherein said vacuum vessel includes a process chamber with a sidewall, said side wall being under temperature control for forming on an inner wall surface thereof a coating film similar in composition to the processing gas used during etching treatment.

2. The plasma processing apparatus according to claim 1, wherein said side wall is subjected to temperature control due to circulation supplement of a heating medium from a heating medium supply means.

3. The plasma processing apparatus according to claim 1, wherein a ring is provided on an outer periphery side of said plate, said ring having a coating film formed on a surface thereof in contact with a plasma during etching treatment, said coating film having a composition of the processing gas.

4. A plasma processing apparatus including a vacuum vessel as evacuated by an evacuation system, gas supply means for supplying a processing gas into the vacuum vessel, an electrostatic chucking device for holding thereon a sample to be processed within said vacuum vessel, a lower electrode, a bias power source connected to the lower electrode for supplying bias power, and means for radiating a high frequency electromagnetic wave within said vacuum vessel, wherein said processing gas is made plasmatic and plasma is generated for use in performing processing of the sample to be processed, wherein said means for radiating a high frequency electromagnetic wave comprises an antenna which is provided within said vacuum vessel, said antenna including a disk-like conductor opposing said lower electrode and being connected to a high frequency bias power supply, and a plate contacted with said disk-like conductor, said plate being spaced apart from the sample by a distance ranging from 30 to 150 millimeters, and wherein said vacuum vessel includes a processing chamber with a side wall, said side wall being under temperature control for forming on an inner wall surface thereof a coating film similar in composition to the processing gas used during

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etching treatment.

5. The plasma processing apparatus according to claim 4, wherein said side wall is subjected to temperature control due to circulation supplement of a heating medium from a heating medium supply means.

6. The plasma processing apparatus according to claim 4, wherein a ring is provided on an outer periphery side of said plate, said ring having a coating film formed on a surface thereof in contact with a plasma during etching treatment, said coating film having a composition of the processing gas.

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